ARCHIVE

for

RATIONAL MECHANICS

and

ANALYSIS

Edited by

C. TRUESDELL & J. SERRIN

Volume 45

SPRINGER-VERLAG
BERLIN · HEIDELBERG · NEW YORK
1972

With the acceptance of a manuscript for publication, the publishers acquire the sole copyright for all languages and countries, including all rights of photocopying or reproduction by any other method, even in microform.

Alle Rechte, einschließlich das der Übersetzung in fremde Sprachen und das der photomechanischen Wiedergabe oder einer sonstigen Vervielfältigung, auch in Mikroform, vorbehalten. Jedoch wird gewerblichen Unternehmen für den innerbetrieblichen Gebrauch nach Maßgabe des zwischen dem Börsenverein des Deutschen Buchhandels e.V. und dem Bundesverband der Deutschen Industrie abgeschlossenen Rahmenabkommens die Anfertigung einer photomechanischen Vervielfältigung gestattet. Wenn für diese Zeitschrift kein Pauschalabkommen mit dem Verlag vereinbart worden ist, ist eine Wertmarke im Betrage von DM 0,40 pro Seite zu verwenden. *Der Verlag läßt diese Beträge den Autorenverbänden zufließen.*

Springer-Verlag Berlin · Heidelberg · New York
Printer: Universitätsdruckerei H. Stürtz AG, Würzburg
Printed in Germany — © by Springer-Verlag Berlin Heidelberg 1972

EDITORIAL BOARD

S. AGMON
The Hebrew University
Jerusalem

S. ANTMAN
Courant Institute
New York University

R. ARIS
University of Minnesota
Minneapolis

L. CESARI
University of Michigan
Ann Arbor

B. D. COLEMAN
Mellon Institute of Science
Pittsburgh, Pennsylvania

L. COLLATZ
Institut für Angewandte Mathematik
Universität Hamburg

C. DAFERMOS
Brown University
Providence, Rhode Island

A. ERDÉLYI
Mathematical Institute
The University of Edinburgh

J. L. ERICKSEN
The Johns Hopkins University
Baltimore, Maryland

G. FICHERA
Istituto Matematico
Università di Roma

H. GÖRTLER
Institut für Angewandte Mathematik
Universität Freiburg i. Br.

A. E. GREEN
Mathematical Institute
University of Oxford

M. E. GURTIN
Carnegie-Mellon University
Pittsburgh, Pennsylvania

D. D. JOSEPH
University of Minnesota
Minneapolis

M. KAC
Rockefeller University
New York 21, New York

C. C. LIN
Massachusetts Institute of Technology
Cambridge, Massachusetts

J.L. LIONS
Département de Mathématiques
Université de Paris

J. B. McLEOD
Oxford University
Oxford, England

I. MÜLLER
The Johns Hopkins University
Baltimore, Maryland

J. C. C. NITSCHE
University of Minnesota
Minneapolis

W. NOLL
Carnegie-Mellon University
Pittsburgh, Pennsylvania

R. S. RIVLIN
Lehigh University
Bethlehem, Pennsylvania

M. M. SCHIFFER
Stanford University
California

J. SERRIN
University of Minnesota
Minneapolis

E. STERNBERG
California Institute of Technology
Pasadena, California

G. STRANG
Massachusetts Institute of Technology
Cambridge, Massachusetts

R. A. TOUPIN
Watson Research Center
Yorktown Heights, New York

C. TRUESDELL
The Johns Hopkins University
Baltimore, Maryland

C.-C. WANG
Rice University
Houston, Texas

Mechanicam vero duplicem Veteres constituerunt: Rationalem *quae per Demonstrationes accurate procedit, & Practicam. Ad practicam spectant Artes omnes Manuales, a quibus utique* Mechanica *nomen mutuata est. Cum autem Artifices parum accurate operari soleant, fit ut* Mechanica *omnis a* Geometria *ita distinguatur, ut quicquid accuratum sit ad* Geometriam *referatur, quicquid minus accuratum ad* Mechanicam. *Attamen errores non sunt Artis sed Artificum. Qui minus accurate operatur, imperfectior est Mechanicus, & si quis accuratissime operari posset, hic foret Mechanicus omnium perfectissimus.* NEWTON

La généralité que j'embrasse, au lieu d'éblouïr nos lumieres, nous découvrira plutôt les véritables loix de la Nature dans tout leur éclat, & on y trouvera des raisons encore plus fortes, d'en admirer la beauté & la simplicité. EULER

... ut proinde his paucis consideratis tota haec materia redacta sit ad puram Geometriam, quod in physicis & mechanicis unice desideratum. LEIBNIZ

The ARCHIVE FOR RATIONAL MECHANICS AND ANALYSIS nourishes the discipline of mechanics as a deductive, mathematical science in the classical tradition and promotes pure analysis, particularly in contexts of application. Its purpose is to give rapid and full publication to researches of exceptional moment, depth, and permanence.

Each memoir must meet a standard of rigor set by the best work in its field. Contributions must consist largely of original research; on occasion, an expository paper may be invited.

English, French, German, Italian, and Latin are the languages of the Archive. Authors are urged to write clearly and well, avoiding an excessively condensed or crabbed style. The editors reserve the right to return to authors manuscripts found deficient in style, form, or clarity.

Manuscripts intended for the Archive should be submitted to an appropriate member of the Editorial Board.

CONTENTS OF VOLUME 45

ARKERYD, L., On the Boltzmann Equation. Part I: Existence 1

ARKERYD, L., On the Boltzmann Equation. Part II: The Full Initial Value Problem 17

DUISTERMAAT, J. J., On Periodic Solutions near Equilibrium Points of Conservative Systems 143

FABES, E. B., B. F. JONES & N. M. RIVIERE, The Initial Value Problem for the Navier-Stokes Equations with Data in L^p 222

GLIKSON, A., On the Existence of General Solutions of the Initial-Value Problem for the Nonlinear Boltzmann Equation with a Cut-Off . . . 35

GREEN, A. E., & N. LAWS, On the Entropy Production Inequality 47

HAYES, M. A., & R. S. RIVLIN, Energy Propagation in a Deformed Elastic Material 54

HILL, C. D., & D. B. KOTLOW, Classical Solutions in the Large of a Two-Phase Free Boundary Problem. I 63

JONES, B. F., see FABES, E. B., *et al.* 222

JOSEPH, D. D., & D. H. SATTINGER, Bifurcating Time Periodic Solutions and their Stability 79

KAUL, H., Isoperimetrische Ungleichung und Gauß-Bonnet-Formel für H-Flächen in Riemannschen Mannigfaltigkeiten 194

KOTLOW, D. B., see HILL, C. D.. 63

LAWS, N., see GREEN, A. E. 47

MARCUS, M., & V. J. MIZEL, Absolute Continuity on Tracks and Mappings of Sobolev Spaces 294

MIZEL, V. J., see MARCUS, M. 294

MÜLLER, I., On the Frame Dependence of Stress and Heat Flux 241

PEDERSON, R., & M. SCHIFFER, A Proof of The Bieberbach Conjecture for the Fifth Coefficient 161

PELETIER, L. A., On the Asymptotic Behaviour of Velocity Profiles in Laminar Boundary Layers 110

PERKO, L. M., Boundary Layer Analysis of the Wide Capillary Tube. . . . 120

RIVIERE, N. M., see FABES, E. B., *et al.* 222

RIVLIN, R. S., see HAYES, M. A. 54

SATTINGER, D. H., see JOSEPH, D. D. 79

SCHIFFER, M., see PEDERSON, R. 161

VILLAGGIO, P., Energetic Bounds in Finite Elasticity 282

WILLEMS, J. C., Dissipative Dynamical Systems. Part I: General Theory . . 321

WILLEMS, J. C., Dissipative Dynamical Systems. Part II: Linear Systems with Quadratic Supply Rates 352

WILMAŃSKI, K., On Thermodynamics and Functions of States of Nonisolated Systems. 251

WOLF, G., Integralrelationen Mathieuscher Funktionen 134

EDITORIAL BOARD

S. AGMON
The Hebrew University
Jerusalem

S. ANTMAN
Courant Institute
New York University

R. ARIS
University of Minnesota
Minneapolis

L. CESARI
University of Michigan
Ann Arbor

B. D. COLEMAN
Mellon Institute of Science
Pittsburgh, Pennsylvania

L. COLLATZ
Institut für Angewandte Mathematik
Universität Hamburg

C. DAFERMOS
Brown University
Providence, Rhode Island

A. ERDÉLYI
Mathematical Institute
The University of Edinburgh

J. L. ERICKSEN
The Johns Hopkins University
Baltimore, Maryland

G. FICHERA
Istituto Matematico
Università di Roma

H. GÖRTLER
Institut für Angewandte Mathematik
Universität Freiburg i. Br.

A. E. GREEN
Mathematical Institute
University of Oxford

M. E. GURTIN
Carnegie-Mellon University
Pittsburgh, Pennsylvania

D. D. JOSEPH
University of Minnesota
Minneapolis

M. KAC
Rockefeller University
New York 10021

C. C. LIN
Massachusetts Institute of Technology
Cambridge, Massachusetts

J. L. LIONS
Département de Mathématiques
Université de Paris

J. B. Mc LEOD
Oxford University
Oxford, England

I. MÜLLER
The Johns Hopkins University
Baltimore, Maryland

J. C. C. NITSCHE
University of Minnesota
Minneapolis

W. NOLL
Carnegie-Mellon University
Pittsburgh, Pennsylvania

R. S. RIVLIN
Lehigh University
Bethlehem, Pennsylvania

M. M. SCHIFFER
Stanford University
California

J. SERRIN
University of Minnesota
Minneapolis

E. STERNBERG
California Institute of Technology
Pasadena, California

G. STRANG
Massachusetts Institute of Technology
Cambridge, Massachusetts

R. A. TOUPIN
Watson Research Center
Yorktown Heights, New York

C. TRUESDELL
The Johns Hopkins University
Baltimore, Maryland

C.-C. WANG
Rice University
Houston, Texas

CONTENTS

WILLEMS, J. C., Dissipative Dynamical Systems. Part I: General Theory 321

WILLEMS, J. C., Dissipative Dynamical Systems. Part II: Linear Systems with Quadratic Supply Rates 352

Printers: Universitätsdruckerei H. Stürtz AG, Würzburg
Printed in Germany — © by Springer-Verlag Berlin Heidelberg 1972